

for this storm at all the lake ports. The following are the maximum wind velocities reported: Marquette, 28 NW.; Milwaukee, 34 W.; Grand Haven, 35 S.; Alpena, 28 S.; Port Huron, 30 SW.; Detroit, 27 SW.; Toledo, 28 SW.; Sandusky, 36 SW.; Cleveland, 34 SW.; Buffalo, 26 SW.; Rochester, 28 SW. Cautionary signals were also displayed for this storm on the Atlantic coast from Eastport to New York. The following maximum velocities were reported: Eastport, 25 W.; Boston, 25 W.; Thatcher's Island, 31 S.; Wood's Holl, 38 SW.; Newport, 30 SW.; New Shoreham, 26 SW.

No. III.—The fall in pressure and circulation of the winds in Nebraska and Kansas on the 16th indicated the development of a storm centre in that region. On the 17th the depression moved across the Northwest and the Upper Lake region. On the 18th over the Lower Lakes and New England. Cautionary signals were displayed on the Upper Lakes and Lake Erie on the 17th, but in the Upper Lakes the storm displayed but slight energy. On Lake Erie the following maximum velocities were reported: Detroit, 30 W.; Sandusky, 30 NW.; Cleveland, 27 NW.; Erie, 26 NW. On the Atlantic coast: Thatcher's Island, 42 NW.; Boston, 26 NW.; Wood's Holl, 36 NW.; Newport, 26 NW.; New Shoreham, 36 N.; Sandy Hook, 44 N.; Barnegat, 35 NW.; Cape May, 43 NW.; Breakwater, 44 NW.; Chincoteague, 30 NE.; Cape Henry, 40 NW.; Kittyhawk, 44 NE., Hatteras, 36 NE. It will be noted that the high winds reported on the Atlantic coast occurred after the passage of the storm centre and therefore are to be associated with the rising barometer which succeeded the low area.

No. IV.—On the 19th a depression of slight energy moved in an easterly track as charted over the Upper Lake region into the Province of Ontario. Cautionary signals were ordered for the ports in the Upper Lakes but they were not justified.

No. V.—On the 22d the barometer was low and slowly falling in the Southwest. At the morning report of the 23d a depression had developed, central in Indian Territory. During the day the storm centre moved in a northeasterly track into Indiana. On the 24th it advanced, with diminished energy, over the Lower Lake region, and on the 25th moved across New England. The Cautionary signals ordered for this storm on lakes Erie and Ontario were not justified.

No. VI.—On the 25th and 26th there was a great barometric depression central in Washington Territory, Oregon and Idaho, which extended east of the Rocky Mountains. On the 27th a new centre of depression appeared to be well defined in Colorado and New Mexico. During the day it moved slowly to the northeast exhibiting but slight energy. On the 28th the storm centre advanced into Minnesota and on the 29th it passed over the Lake Superior region beyond the limits of the chart. This storm did not develop any special energy. Cautionary signals were displayed on Lakes Superior, Michigan and Huron and for the western ports of Lake Erie. The following maximum winds were reported: Duluth, 30 W.; Alpena, 28 SE.; Detroit, 27 S.; Sandusky, 27 S.; Cleveland, 29 S. It will be noted that more storm energy was exhibited on Lake Erie than near the track of the centre of low area.

*Hurricane at Manzanilla, Mexico.*—October 27th, 3 p. m., strong gale from the NE., barometer fell rapidly from 29.1 to 28.0. At about 4.50 p. m. the gale increased to a hurricane, the center of which struck Manzanilla with terrific force and terrible disaster. 28th, 7.50 a. m. there was a lull in the storm of about 10 minutes duration when the wind suddenly changed to the SW. with hurricane force. Every building in the city without an exception was completely destroyed entailing a loss in the aggregate of over \$500,000. In the harbor there were present at the time of storm one ship, two barks, two schooners, together with several lighters and small boats. All vessels except one bark were a total loss.

## INTERNATIONAL METEOROLOGY.

International charts, Nos. IV and V, accompany the present REVIEW. The former is published for August, 1879, and continues the series of this chart commenced in January, 1877. Chart No. V is prepared for the month of October, 1879, and continues the series of this chart commenced in November, 1877. It will be observed that the numbers of these charts have been changed, being one less in each case. This modification affects only the numerical value and not the character of the charts, having been done because of the discontinuance some time since of the old chart No. IV.

*Chart No. IV,* shows the mean pressure, temperature and the prevailing direction of the wind at 7.35 a. m., Washington, or 0.43 p. m., Greenwich mean time, for the month of August, 1879, over the Northern and at certain isolated stations in the Southern Hemisphere. Two areas of low pressure, (29.70) are shown upon the chart for the present month, one situated over the Atlantic ocean just south of Iceland, running eastward to include Scotland and westward to the 35th parallel; the other area embraces southwestern Siberia. The isobar of 29.8, commencing near 55° N., 55° W., passes southeastward reaching the 50th parallel near the meridian of 30° W., thence eastward along that parallel to 10° W., where its course changes to NE., reaching the Baltic near Wisby; at this point it turns to the N., curving around the Gulf of Bothnia to the west and passing thence eastward to the White Sea; from this locality the isobar runs southwestward to near the Black Sea, thence eastward to the Caspian, where it curves again to the southwest reaching the Mediterranean north of Beirut. This disposition of pressure places the western half of Russia and the whole of Asia, except scattering coast stations, within the area of 29.8. It will be seen

that upon leaving the eastern coast of Asia the pressure gradually rises, being about 29.9 over the Japan Islands. If we may be allowed to base judgment upon the reports of isolated stations between the parallels of 60° and 70° N., it is safe to conclude that the area of 29.8 surrounds the Arctic ocean. The pressure over the United States nowhere falls below 29.9, except in California, where, in the central portion of the state a small area of 29.8 probably exists. Over British India the pressure ranges from 29.4 to 29.8. The area of highest pressure (30.2) covers a very irregular portion of the ocean southwest of the Azores. In the United States the maximum pressure (30.0) covers the Gulf and South Atlantic states, Tennessee and the Ohio valley. In Europe the barometer is everywhere below 30.0 except in extreme southwestern France, northern Spain and in Portugal. The extreme mean pressures for the month are 29.4 (lowest) at Lahore and 30.23 (highest) at Ponta Delgado. The extreme monthly range of mean pressure is 0.83 inch, which is 0.05 inch larger than August, 1877, and 0.12 inch larger than August, 1878. The following extreme monthly mean temperatures are given in Fahrenheit's scale: lowest, Godthaab, York Factory and Ft. St. Michaels, 45°; Stykkisholm, 53°; Moose Factory, 57°; Nikolaievsk on the Amoor, 58°; highest, Biskra, 102°; Laghouat, 97°·2; Saida, 91°·9; Tebessa, 91°·8; Lahore, 91°; Beirut, 88°; Tashkend, 86°. The prevailing direction of the winds over the United States, was *southwest to northwest* along the Middle Atlantic and New England coasts, in the Lake region and over the Canadian Maritime Provinces; *north-easterly* along the South Atlantic and Gulf coasts; *southerly* in the interior and westward to the Pacific. Over the Atlantic ocean, *northeast to southeast* and *southwest* south of parallel 40° N., and to the northward of that parallel *southwest to northwest*. Over Europe, *south to west* in Scandinavia and the British Isles; *southwest to northwest* in the interior; elsewhere *variable*. In Algeria *northerly*. In Hindostan *westerly* and along the Asiatic coast *southwesterly*. Compared with August, 1877 and 1878, the temperature over the United States is generally higher over the Plateau and Pacific coast regions and in southern Texas, elsewhere it is lower particularly over the interior and in the eastern districts. The pressure is everywhere lower, being most marked on the Pacific coast and in the Gulf and Atlantic coast states. Over the Atlantic, where comparison can only be made with 1878, the region of highest pressure shows an increase of from 0.1 to 0.15 inch. There is a general rise south of the 40th parallel, while to the northward the deficiency ranges from 0.05 to 0.2 inch being most marked between the parallels of 55° and 65° N. The temperature is lower between the parallels of 50° and 60° N., but to the southward there is very little change. Over Europe there is a general rise in pressure south of the 50th parallel being most marked along the northern shores of the Mediterranean, while to the northward the reverse takes place principally over Scandinavia and the northern portion of the British Isles. With regard to the temperature there is a very marked rise over northern Europe, particularly Scandinavia and northwestern Russia; in the interior there is a slight fall which disappears to the southward where along the Mediterranean there is little or no change. In Algeria there is quite a marked rise in temperature and a decided fall in pressure. In Hindostan the changes in temperature and barometer are quite irregular; in the northern Provinces there is a general fall in both while to the southward the deficiency in pressure is quite evident. The accompanying table shows the deviations in temperature and barometer at isolated stations for the month of August, 1879, as compared with the means of the past two years.

*Comparative Thermometric and Barometric Means, with corresponding Departures.*

STATION.	Mean Temperature.			Mean Barometer.			STATION.	Mean Temperature.			Mean Barometer.		
	August, 1877-78.	August, 1878.	Departure.	August, 1877-78.	August, 1878.	Departure.		August, 1877-78.	August, 1878.	Departure.	August, 1877-78.	August, 1878.	Departure.
York Factory .....	49.8	45.1	-4.7	29.84	29.85	+0.14	Bridgetown .....	85.0	82.5	-2.5	30.10	29.95	-0.05
Godthaab .....	45.9	45.1	-0.8	29.92	29.74	-0.18	Navassa .....	81.1	83.2	+2.1	29.98	29.95	-0.03
Stykkisholm .....	50.9	53.1	+2.2	29.85	29.74	-0.19	Medellin .....	71.6	63.6	-8.0			
Tromsø .....	50.9	58.5	+7.6	29.80	29.75	-0.05	San Jose de Costa Rica .....	65.9	67.1	+1.2			
Thorshavn .....	51.8	52.0	+0.2	29.89	29.72	-0.17	Mexico .....	56.1	56.7	+0.6	30.13	30.00	-0.13
Archangel .....	57.6	61.3	+3.7	29.73	29.82	+0.09	Mellourne .....	49.8	47.4	-2.4	29.83	30.01	+0.01
Ekaterinburg .....	64.2	60.6	-3.6	29.73	29.70	-0.03	Hobart Town .....	81.9	80.4	-1.5	29.99	29.99	Norm 1
Barnaul .....	70.4	62.4	-8.0	29.77	29.68	-0.09	San Juan de Puerto Rico .....	84.3	84.1	-0.2	30.01	29.99	-0.02
Yeniseisk .....	66.8	68.5	+1.7	29.74	29.77	+0.03	Nassau .....	81.4	82.5	+1.1	30.00	29.95	-0.05
Nikolaievsk, on the Amoor .....	59.3	58.1	-1.2				Havana .....	74.4	81.0	+6.6	29.88	29.82	-0.06
Pekin .....	76.2	77.4	+1.2	29.79	29.72	-0.07	Astrakhan .....	87.8	88.7	+0.9	29.89	29.80	Norm 1
Zi-Ka-Wei .....	73.9	80.2	+6.3	29.82	29.80	-0.02	Athens .....	95.2	91.4	-3.8	29.30	29.48	-0.02
Tokel .....	73.5	77.4	+3.9	29.87	29.82	-0.05	Lahore .....	84.4	83.7	-0.7	29.80	29.78	-0.02
Tashkend .....	79.7	86.0	+6.3	29.75	29.63	-0.12	Tiflis .....	80.1	87.2	+7.1	30.08	29.98	-0.10
Nukuss .....	84.5	85.8	+1.3	29.76	29.73	-0.03	Laghouat .....	80.7	79.2	-1.5	29.91	29.82	-0.09
Beirut .....	90.0	88.0	-2.0	29.80	29.74	-0.06	Fort de France .....	73.9	73.7	-0.2	30.03	30.05	+0.02
Mauritius .....	72.2	70.9	-1.3	30.19	3.18	-0.01	Yokohama .....	76.9	77.8	+0.9	29.83	29.83	Norm 1
Fort Napier .....	69.1	69.8	+0.7	30.01	30.04	+0.03	Lisbon .....	83.1	82.9	-0.2			
Cape Town .....	54.3	62.2	+7.9	30.20	30.17	-0.03	Madrid .....	83.4	81.7	-1.7	29.93	29.97	+0.04
Free Town .....	80.4	78.5	-1.9	30.00	30.00	Norm 1	Gagliari .....	78.9	81.9	+3.0	29.96	29.97	+0.01
Paramaribo .....	81.7	81.2	-0.5	30.03	30.01	-0.02	Gibraltar .....	78.0	80.0	+2.0	29.80	29.80	-0.01
Funchal .....	76.9	75.0	-1.9	30.10	30.12	+0.02	Sandwich Manse .....	57.0	56.0	-1.0	29.90	29.89	-0.01
Ponta Delgado .....	75.2	78.1	+2.9	30.08	30.23	+0.15	Malta .....	84.7	83.9	-0.8	29.95	29.94	-0.01
Angra .....	72.2	74.3	+2.1	30.07	30.18	+0.11							

*Chart No. V.*—This chart displays the tracings of the probable courses of thirty-one of the principal storm areas of the Northern Hemisphere for the month of November, 1879. The approximate paths of progressive movement are based upon daily simultaneous international observations to the number of over 650, besides a large mass of irregular data which reaches this office in various ways from the logs of vessels of the merchant marine of the North Atlantic ocean. Concerning the general distribution of the paths of the areas of barometric minima the following is given: Fourteen areas traversed portions of the United States, but none of them were entirely confined to its boundaries; four of these came from the Pacific ocean between the parallels of  $40^{\circ}$  and  $50^{\circ}$  N.; five first appeared in the Rocky Mountain regions; ten reached the Atlantic ocean, four of which crossed the same to the mainland of Europe. Of the storms over the Atlantic, one came from the West Indies; one formed in the vicinity of the Azores and one in the vicinity of the Cape Verd Islands. Of the storms over Europe, six came from the Atlantic ocean, one of which entered the continent over Portugal and the remainder came from between the parallels of  $60^{\circ}$  and  $70^{\circ}$  N.; one storm was confined almost entirely to the Mediterranean, while another first appeared in the vicinity of the White Sea. Off the Asiatic coast three storms first appeared over the China Sea and two others formed over the ocean southeast of the Japan Islands, all moving to the northeastward. Of the storms in North America, No. I appeared in the Lower Missouri valley during the 1st, accompanied by heavy snow-falls and brisk to high winds. By morning of 2nd it covered Lake Michigan, and during the day passed eastward over the Lower Lake region, accompanied by dangerous winds and heavy snow; 3d, central in southern New York and by the following morning had passed eastward over the ocean south of Nova Scotia. Following the passage of this area off the New England coast heavy northerly and westerly gales, with snow, prevailed during the latter part of the 3d and throughout the 4th. 3d, in  $39^{\circ}$  N.,  $66^{\circ}$ ,  $40'$  W., heavy N. gale, bitterly cold, stormy sea; in  $43^{\circ}$ ,  $36'$  N.,  $59^{\circ}$ ,  $24'$  W., violent westerly gale; in  $42^{\circ}$  N.,  $64^{\circ}$ ,  $58'$  W., WNW. to NE., very changeable and stormy. 4th, in  $45^{\circ}$ ,  $01'$  N.,  $54^{\circ}$ ,  $06'$  W., SE. to SW. gales, with fog and snow; in  $40^{\circ}$ ,  $27'$  N.,  $41^{\circ}$ ,  $44'$  W., northeasterly gales, with violent squalls of snow and hail; in  $42^{\circ}$ ,  $21'$  N.,  $64^{\circ}$ ,  $26'$  W., ESE, SW. and W., fierce squalls; in  $43^{\circ}$  N.,  $52^{\circ}$  W. gale from ESE., veering to W., with very high confused sea and heavy rain. 5th and 6th, depression moved slowly northeastward in the vicinity of  $50^{\circ}$  N. and between the parallels of  $30^{\circ}$  and  $50^{\circ}$  W. Vessels arriving in New York harbor on the 6th reported the experience of violent gales and heavy snow during the 4th and 5th, the latter having collected to the depth of from 6 to 10 inches on their decks. 5th, large icebergs were encountered in  $47^{\circ}$ ,  $08'$  N.,  $47^{\circ}$ ,  $30'$  W., and in  $47^{\circ}$  N.,  $47^{\circ}$ ,  $40'$  W. 6th, in  $50^{\circ}$ ,  $08'$  N.,  $41^{\circ}$ ,  $45'$  W., SW. to NW. strong gale, heavy cross seas; in  $46^{\circ}$ ,  $25'$  N.,  $42^{\circ}$ ,  $15'$  W., S. to NW. fresh gale, high sea; in  $49^{\circ}$ ,  $46'$  N.,  $43^{\circ}$ ,  $40'$  W., a chain of icebergs were encountered bearing from NNE. to S. by E., and small pieces were scattered in all directions. During the 7th, as the central area passed northward off the western coast of Ireland the barometer at Stykkisholm fell from 29.76 to 29.09 by morning of the 8th, winds shifting from SW. to S. and W. As the depression moved eastward near parallel  $70^{\circ}$  N. the pressure rose rapidly over the island, (0.74 inch in 24 hours,) with winds shifting to east. 9th, central off the northwestern coast of Norway; Brono, 29.21, a fall of 0.64 inch in past 24 hours, SW., heavy rain; Tromso, 29.21, a fall of 0.47 inch, S., cloudy; Bergen, 29.84, a fall of 0.34 inch, S., heavy rain. 10th, central over Lapland; Haparanda, 28.83, NW., a fall of 0.86 inch; Tromso, 29.19, NW.; Archangel, 28.98, a fall of 0.80 inch, SE., snow; St. Petersburg, 29.42, a fall of 0.62 inch, WNW., cloudy. 11th, central east of the White sea; Archangel, 29.00, SSW., cloudy. 12th, central south of the Gulf of Ob, disappearing on the following day north of Yeniseisk, at which station southerly winds and snow had prevailed since the 11th. No. IV.—On the 4th an extensive area of low pressure entered North America from the Pacific ocean near the 50th parallel and moved slowly eastward in that latitude, reaching Manitoba by the 7th, where the central area was enclosed by the isobar of 29.40. During this day and the following the depression moved slowly eastward over the southern portion of Hudson's Bay Territory, the barometer at Moose Factory, James' Bay, falling to 29.28, wind SW., force 6. 10th, passed eastward off the southeastern coast of Labrador and by the morning of the 12th had probably reached the ocean in the vicinity of  $69^{\circ}$  N.,  $40^{\circ}$  W. The following data is from Godthaab during the passage of the depression to the south and east of Greenland: 10th, 29.89, ENE.; 11th, 29.74, ENE.; 12th, 29.38, NE.; 13th, 29.17, N.; 14th, 29.32, WSW.; 15th, 29.49, NNE. On the approach and passage of the depression Stykkisholm, Iceland, reported the following: 12th, 30.26, E.; 13th, 29.59, SE., rain; 14th, 29.24, S., rain; 15th, 29.16, calm, rain; 16th, 29.30, SW., rain; 17th, 29.40, S., rain; rain continued at this station until the 21st. 17th, depression central off the western coast of Norway; Tromso, 29.12, a fall of 0.65 inch, SW., rain; Brono, 29.60, a fall of 0.37 inch, WSW., threatening; Christiana, 29.89, a fall of 0.19 inch, SSW., rain and snow. 18th, disappeared north of Scandinavia, the pressure at northern stations rising rapidly from 0.10 to 0.60 inch and winds shifting to south. No. VIII.—This area developed over the Middle Plateau during the 6th and 7th, and passed rapidly eastward into Colorado and thence northeastward to the Upper Lakes, accompanied in Arkansas and Missouri by violent local storms. During the 9th, moved eastward over northern Canada, reaching the Gulf of St. Lawrence by the 10th, and a position in about  $50^{\circ}$  N.,  $50^{\circ}$  W., by the 11th. 12th, central in about  $50^{\circ}$  N.,  $40^{\circ}$

W.; in 49° N., 41°, 30' W., 29.34, NW., force 6; in 49°, 20' N., 31°, 40' W., 29.15, S., heavy rain; in 50°, 40' N., 31°, 25' W., 29.50, SSE., force 6; in 51°, 19' N., 35°, 55' W., SE. strong gale, rain, heavy sea; in 38° N., 42° W., hurricane from NW. for 36 hours, hove to under bare poles for 12 hours. 13th, in 50°, 01' N., 43°, 36' W., W. to NW., fresh gales; in 48°, 32' N., 37°, 11' W., 29.32, S. to N., stormy, very high sea; in 49°, 20' N., 38°, 15' W., 29.34, N., violent gale, with rain. 14th, in 42° N., 38° W., hurricane from SW. to NNE.; in 41°, 20' N., 41°, 50' W., sudden gale, wind came from N. with great fury and in three hours raised a tremendous sea, decks swept; in 40° N., 41° W., heavy gale from NE. to NW., lasting 24 hours, then shifting to SW. and continuing for 8 hours; in 47°, 10' N., 43°, 50' W., 29.72, NW., hurricane; in 48°, 30' N., 30°, 45' W., 29.65, NW., violent gale. 15th, in 27° N., 36° W., heavy gale from WSW., lasting 36 hours; in 40° N., 40° W., hurricane from SE. to NW., high confused sea; in 41° N., 36° W., violent N. gale and tremendous sea, vessel thrown on beam ends and abandoned. 16th, together with area No. IV then central off the eastern coast of Iceland an elongated area of low pressure, (generally below 29.60,) extended southward to near the Azores. On the 17th areas No. IV and No. VIII combined to the northward of the British Isles, accompanied by a rapid fall in the barometer, the central area being inclosed by the isobar of 29.20. No. X.—This area appears to have moved southward along the North Pacific coast to near the 35th parallel, when it changed its course to the eastward, crossing California south of San Francisco, at which station the barometer fell to 29.26, the lowest reading reported in the past nine years. Its passage through the Middle and Southern Plateau regions was accompanied by heavy snow and rain. From Colorado northeastward the depression moved very rapidly to Lake Superior by afternoon of the 11th and thence southeastward over Canada to northern New York, disappearing during the 12th and 13th over the Canadian Maritime Provinces under the influence of areas Nos. VIII and XII, probably combining with the former off the Banks of Newfoundland. No. XII.—Following the passage of area No. X over the Southern Plateau the pressure remained comparatively low developing on the 11th an area of 29.60 over New Mexico. During the 11th this depression moved east-northeast to the Upper Mississippi valley, where it was central morning of the 12th. From this position it moved eastward over the Lake region, accompanied by storms of wind and rain; heavy thunder storms were experienced in southern New York. 13th, central off the Massachusetts coast and during the day probably disappeared in a trough of low pressure extending westward from 44° N. 35° W., to near 65° W. No. XIII appeared off the North Pacific coast during the 14th and passed rapidly eastward over the northern territories, reaching Lake Superior by morning of the 15th, where the central area was inclosed by the isobar 29.60, the lowest barometer being at Duluth 29.42. Owing to the presence of area No. XVII, on this day central south of Lake Erie, an extensive area of barometric minima formed over the Lake region, Ohio valley and Canada which, during the day, combined the effects of the two areas resulting in a single area, (No. XVII,) which, on the 16th became central over Newfoundland. No. XIV.—Resulting from a general fall in the barometer from Texas northward to Hudson's Bay forming a barometric trough of 29.80, this depression appeared central in the southern portion of the Upper Mississippi valley on the 13th. During the day it passed northeastward to Lake Michigan, accompanied in the States of Illinois, Indiana and Kentucky by heavy rains and thunder storms, causing considerable damage to property. On the 14th passed northeastward into northern Canada, disappearing on the following day as an individual area in the extensive depression formed by the combination of areas No. XIII and XVII over the Lake region and Canada. No. XVI.—This area first appeared over the Middle Rocky Mountain region where, on the 15th, it was accompanied by snow and high westerly winds. During the 16th the central depression extended rapidly southeastward into Texas, followed by northwesterly winds and increasing precipitation. From Texas the course of the depression changed to east-northeast, moving across the northern portion of the Gulf states and thence northeastward passing off the Virginia coast near the 37th parallel on the 18th. During this portion of its course after leaving the Gulf states, the winds shifted to northerly over the Lower Lakes, accompanied by heavy snow storms and severe gales with considerable loss to shipping. Over the ocean an extensive area of low pressure formed in the vicinity of 35° N., 70° W., accompanied by violent gales and much damage to shipping. 18th, in 39° N., 66° W., hurricane from SE. to NW., lasting five hours, then to SW., lasting three days; off Cape Look-out, 3 a. m. took heavy SE. gale, wind suddenly shifted to SE. and about two hours thereafter veered to SW. In 41°, 42' N., 64°, 40' W., 8 p. m., ESE., gale rapidly increasing in force and slowly veering to the SE. and S., barometer rapidly fell to 29.47. 19th, passed northeastward south of Nova Scotia and disappeared as an individual depression under the influence of area No. XVIII advancing from the southwest, or possibly by a rapid movement eastward continued as area No. XX central north of the Azores on the 19th. On this day an area of low pressure (probably about 29.70) prevailed over the ocean between the parallels of 35° and 45° N. and the meridians of 20° and 60° W. In 40°, 09' N., 68°, 56' W., 6.30 a. m., wind shifted from SE. to NE., increasing northerly sea, barometer rising; at midday wind again shifted through W. to NE., with hurricane force, barometer 29.00; at evening wind shifted to NW., with hurricane force, very heavy NW. sea. In 33°, 37' N., 73°, 20' W., heavy gale from NW., lasting 10 hours, barometer 29.25; in 39° N., 68° W., heavy gale from ESE. to WNW., tremendous sea; in 42°, 38' N., 53°, 24' W., NNW., SW. SE. and W., strong gales and rain; towards morning strong westerly gale

and heavy cross sea. In  $47^{\circ}$ ,  $25'$  N.,  $44^{\circ}$ ,  $28'$  W., NW. and W., severe gales, barometer falling rapidly; in  $55^{\circ}$ ,  $30'$  N.,  $55^{\circ}$ ,  $14'$  W., hurricane from W. to NW., lasting 20 hours. No. XVII.—This area developed over the Lower Lakes on the 15th as an offshoot of an extensive area of barometric minima covering the country between the parallels of  $40^{\circ}$  and  $50^{\circ}$  N., and the meridians of  $70^{\circ}$  and  $100^{\circ}$  W. During the day this depression passed northeastward to the Gulf of St. Lawrence, where it was central on the 16th, moving thereafter to the southeast over Newfoundland, being central by morning of the 17th in the vicinity of  $50^{\circ}$  W. In  $44^{\circ}$ ,  $50'$  N.,  $53^{\circ}$ ,  $20'$  W.,  $29.87$ , NNW., force 7; in  $50^{\circ}$ ,  $56'$  N.  $44^{\circ}$ ,  $48'$  W., SW. to NW., strong storm, high seas. During the day course of depression changed to the NE., being central on the 18th in about  $50^{\circ}$  N.,  $30^{\circ}$  W., after which it again changed, moving almost directly north to the western coast of Iceland, rounding the island to the northward and passing thence eastward to northern Scandinavia. 18th, in  $50^{\circ}$ ,  $50'$  N.,  $32^{\circ}$ ,  $10'$  W., heavy SE. gale shifting to NE., with high confused sea. The following observations were reported from Stykkisholm, Iceland, during the advance and passage of the depression: 18th,  $29.29$ , SW., force 5, rain; 19th,  $29.74$ , calm, rain; 20th,  $29.64$ , S., force 6, rain; 21st,  $30.33$ , SW., force 1, clearing; 22d,  $30.63$ , NE., force 4, fair. Owing to the presence of an extensive area of high pressure over the British Isles and to the westward over the ocean, the change in pressure over Iceland during the passage of the depression was extremely sudden. On the 22d, with diminished energy, the depression became central off the northwestern coast of Norway and during the day passed southeastward into Finland. 24th, central southeast of the White sea, followed to the westward over Finland and vicinity by S. to N. and NW. winds, with snow. 25th, central in western Siberia, with slowly increasing pressure; Kasan,  $29.89$ , NNW., snowing; Ekaterinburg,  $29.82$ , SW., threatening. 26th, central in the valley of the Yenisei, disappearing thereafter over central Siberia; Yeniseisk,  $29.72$ , a fall of 0.21 inch in past 24 hours, W., threatening; Barnaul,  $30.04$ , a fall of 0.43 inch, SW., cloudy. No. XXII.—During the 18th, while No. XVI occupied the South Atlantic coast a very sudden fall in the barometer occurred over the Lake Superior region and to the northward developing on the following morning into an area of  $29.40$ . 19th, Moose Factory,  $29.26$ , a remarkable fall of 1.13 inches in past 24 hours, wind S., force 6, heavy snow-storm; Marquette,  $29.51$ , a fall of 0.89 inch, winds from N. to W.; Duluth,  $29.66$ , a fall of 0.82 inch, winds from NW. to SW.; Alpena  $29.69$ , a fall of 0.67 inch, winds from N. to SSW. During the day the storm passed southeastward over the Lake region, where heavy southwest to northwest gales, with snow, prevailed, driving many vessels ashore and wrecking others. This storm proved to be one of the severest for many years upon the Lakes, causing great damage by shipwreck and the loss of many lives. Over Canada and New England the storm was equally severe being accompanied by violent southwest to northwest winds and snow. By afternoon of the 20th the depression had combined with No. XVIII, the West India hurricane, then central off the Nova Scotia coast; lowest barometer at Halifax,  $28.59$ , a fall of 1.10 inches in past 24 hours. Magdalen Islands, violent gale from SE. veering to NE., and increasing to a hurricane. Strait of Canso, heavy SE. gale. At Cow Bay, Louisburg and Glace Bay, hurricane from SE. to SSW. On the Grasp coast and in Northumberland Strait, heavy NE. gales accompanied by high tides, the latter causing considerable damage at Point du Chêne. A further description of this storm is to be found under area No. XVIII, of which it formed a part on and after the 20th. No. XXIII.—This area passed southeastward from the Saskatchewan valley during the 20th and 21st and by morning of the 22d was central north of Lake Superior inclosed by the isobar of  $29.40$ . During this day the depression passed southeastward over the Upper Lake region followed by winds shifting from SW. to NW., increasing to high and accompanied by snow. Central over the Province of Ontario on the 23d the depression changed its course more to the east, reaching the Gulf of St. Lawrence by the following morning, disappearing thereafter in an area of high pressure ( $30.30$ ) prevailing to the southward. No. XXV.—Following rapidly the passage of the preceding area the pressure on the 24th again fell in the Northwest and Manitoba; Ft. Garry,  $29.48$  a fall of 0.80 inch in past 24 hours; Pembina,  $29.49$ , a fall of 0.75 inch; Breckenridge,  $29.67$ , a fall of 0.67 inch. During the day the depression passed rapidly northeastward to Hudsons Bay, lowest barometer,  $29.41$ , at Moose Factory, James Bay, a fall of 0.50 inch in past 24 hours. During the 25th the area passed eastward into Labrador, and disappeared on the following day under the influence of a high pressure ( $30.20$  to  $30.40$ ), to the southward. No. XXIX.—This depression appearing in Idaho on the 25th, probably passed southward from the British Possessions during the continuance of an extensive area of low pressure which prevailed over the Saskatchewan valley on the 24th, and later moved eastward as area No. XXV. During the 25th and 26th, the depression moved southeastward into New Mexico: thence changing its course to the northeast it reached the Upper Lake region by morning of the 28th, where the central area was inclosed by the isobar of  $29.60$ , and the area of precipitation embraced the Lake region, the Ohio and Upper Mississippi valleys, in the first of which regions a severe storm of wind, rain, and snow prevailed throughout the day. 29th, central over northern Maine with diminished energy, the latter fact owing to the presence of three areas of high pressure ( $30.40$ ) situated as follows: one in  $55^{\circ}$  N.,  $30^{\circ}$  W., another in  $40^{\circ}$  N.,  $55^{\circ}$  W., and the third in  $35^{\circ}$  N.,  $95^{\circ}$  W. 30th, depression central over the Gulf of St. Lawrence. The further course of this area will appear on the December chart. No. XXX.—On the 26th, an extensive area of barometric minima covered the country between the parallels of  $30^{\circ}$  and

45° N., and from the 95th meridian westward to the Pacific. This depression embraced the present area and No. XXIX, the latter then central in the Middle Rocky Mountain region. During the 27th and 28th, area No. XXX moved northeastward over the Lake region and Canada, in connection with No. XXIX, but somewhat in advance of, and a little to the north of the latter. On the 29th these two areas combined in the Lower St. Lawrence valley, moving eastward thereafter as area No. XXIX. No. XXXI.—The presence of this area on the north Pacific coast, on the morning of the 29th, caused general rain throughout northern California, Oregon, and Washington Territory, and a fall in pressure of from 0.20 to 0.40 inch. During the day the depression moved northeastward into the British Possessions, where on the morning of the 30th it appeared central in the Saskatchewan valley. Its course thereafter will probably appear on the December chart. Of the storms over the Atlantic the following descriptions are given: No. XVIII, a storm of cyclonic origin, probably developed on the 16th over the Caribbean sea, south of Hayti: St. Thomas, 29.97, SE., heavy rain; Navassa, 29.89, N., fair; Kingston, Jamaica, 30.12, NW., fair; Havana, 30.03, calm, clear; Nassau, 30.06, NE., fair. 17th, St. Thomas, 29.93, SE., cloudy; Navassa, 29.85, NE., cloudy; Kingston, Jamaica, 30.10, calm, fair; Havana, 30.00, calm, clear; Nassau, 30.03, NE., fair. 18th, probably central over eastern Cuba; Navassa, 29.87, NE., fair; Kingston, Jamaica, 30.09, calm, fair; Nassau, 30.04, NE., threatening; Havana, 29.94, calm, fair; Grand Turk, Bahamas, 29.75, a fall of 0.10 inch in past 24 hours, ESE., strong gale. 19th, Nassau, 29.86, SE., fair; Grand Turk, Bahamas, 29.70, S., strong gale; Havana, 29.87, SW., cloudy. During the day the depression curved to the northeast in about 30° N., 78° W., and the southwesterly winds accompanying area No. XVI along the South Atlantic coast shifted to N. and NE., with rain and slowly falling pressure. Over the ocean heavy gales were experienced causing much damage to shipping, as follows: schooner *Victor*, from Baracoa, Cuba, to New York, had severe NW. gales in Gulf stream, lasting 12 hours; schooner *Rit Carson*, from Miragoane, Cuba, for New York, experienced very violent NNE. gales, vessel fell off in trough of sea, decks swept; ship *Stewart Freeman*, 200 miles off Cape Henlopen, had hurricane from NW. and was blown off nearly to the Bermudas; in 36° N., 75° W., severe NNW. gale; in 34° N. 72° W., severe hurricane from E. by S. 20th, depression central in about 38° N., 70° W., inclosed by the isobar of 29.00; in 34°, 06' N., 73°, 41' W., hurricane from east veering to NW., last several hours; in 34°, 60' N., 73°, 30' W., brig *Shannon*, from Cape Haytien to New York, had revolving gale beginning at ENE., and backing to NNW., perfect hurricane, heavy cross seas; in 41°, 13' N., 63°, 18' W., terrific gale from SE. to NW., veering to S. and lasting 48 hours; ship *Dereon*, north of Cape Hatteras, terrific gale from SSW., veering to N., vessel on beam ends for six hours; in 32°, 05' N., 70°, 30' W., bark *B. F. Watson*, on edge of revolving gale beginning at S. and hauling to W., barometer 29.30; in 34°, 31' N., 70°, 10' W., hurricane from SW. veering to NW. lasting 24 hours; in 32°, 20' N., 73°, 20' W., very heavy storm commencing at ESE., and veering suddenly to W., heaviest from WSW., lasting 4 hours and then settling down to a heavy gale from the NW., which continued for 36 hours; in 42°, 30' N., 61°, 30' W., SE. to SW., heavy gales, barometer fell to 28.90; in 35°, 22' N., 69°, 30' W., terrific gale from SW., veering to NW., lasting 48 hours. On the 20th, as the storm advanced northeastward, northerly gales with light to heavy snow, prevailed over the Canadian Maritime Provinces; on Newfoundland Banks, hurricane from ESE., with a blinding snow storm and tremendous sea; on Manicougan Shoals, mouth of St. Lawrence, 7 p. m., violent snow storm. After combining with area No. XXII off the Nova Scotia coast, the depression by morning of the 21st was probably central, but with diminished energy over the Gulf of St. Lawrence; Sydney, C. B., 29.15, a fall of 0.68 inch, SW., cloudy; Chatham, 29.11, a fall of 0.69 inch, W., cloudy; Charlottetown, 29.09, a fall of 0.66 inch, W. clearing; in 38°, 50' N., 61°, 56' W., terrific squalls and tremendous sea, vessel thrown on beam ends; in 40°, 25' N., 72°, 54' W., WNW., hard gale, high sea; in 43°, 28' N., 56°, 38' W., hard gale from WNW., shifting to SW. 22nd, depression central in about 50° N. 45° W., followed over the Canadian Maritime Provinces by westerly winds, rising pressure and clearing weather; in 43°, 06' N. 53°, 18' W., W., strong gale, fierce hail squalls, high confused sea; in 46°, 30' N. 51°, 26' W., SW. to W., strong gale, high sea; in 40°, 52' N., 63°, 37' W., W. by N. and NW., strong gale, high sea, clearing weather; in 40°, 45' N., 60°, 29' W., NW., strong gale, fierce squalls. By morning of the 23rd the depression had disappeared under the influence of a high pressure area (30.40) which rapidly advanced from the southwest and combined with a similar area occupying the ocean in the vicinity of 50° N. 30° W. No. VI.—During the 5th the barometer fell from 0.10 to 0.30 inch in the vicinity of 25° N. 25° W., developing on the 6th an area of 29.80, with the lowest pressure, 29.74, in 24°, 14' N. 23°, 30' W., accompanied by SW. squalls and rough sea. From the 6th to the 8th the depression moved slowly northward to the Azores, where on the latter date the lowest pressure was reported from Ponta Delgado, 29.74, a fall of 0.17 inch in past 24 hours, wind NE. On this day the depression curved to the eastward, followed on the 9th by a rise in pressure of from 0.10 to 0.20 inch over the Azores, with clearing weather. During the 10th and 11th disappeared in an area of high pressure (30.40) which moved southwestward from the Bay of Biscay. No. XX.—As previously stated under the description of area No. XVI, which on the 19th was central south of Nova Scotia, a very extensive area of low pressure covered the ocean on this day between the parallels of 40° and 50° N. Reports from

the logs of vessels are not sufficiently numerous and reliable to decide the probability of a connection between areas No. XVI and XX so far, at least, as to say that they were one and the same storm. Central north of the Azores on the 19th with the lowest pressure about 29.75, the depression moved southeastward. On the morning of the 21st the central area was inclosed by the isobar of 29.40, but by the following morning with a further movement eastward the pressure had rapidly increased and the depression was marked by the isobar of 29.70. During the 22d and 23d disappeared under the influence of a high pressure area (30.20 over Algeria and southern Spain. No. XXIV.—Immediately following the disappearance of area No. XX the pressure fell over the ocean south of the Maderia Islands and on the 23d the barometer at Funchal rose 0.10 inch, with winds shifting from SW. to ENE. 25th, depression central between the Azores and Maderia Islands; Ponta Delgado, 29.62, a fall of 0.33 inch in past 24 hours, wind shifted from E. to NE., force 6; Angra, 29.80, a fall of 0.21 inch, wind NE.; Funchal, 29.58, a fall of 0.20 inch, wind shifted from NE. to S. Along the coasts of Portugal and Spain the barometer fell from 0.10 to 0.20 inch, with southerly winds and rain. 26th, depression changed its course to the eastward being central north of the Maderia Islands; Funchal, 29.31, a fall of 0.25 inch, SW., rain; in 31°, 35' N., 16°, 50' W., 29.35, SW., force 7, rain; Ponta Delgado, 29.49, NE., force 6, rain. 27th, central off the coast of Portugal; Lisbon, 29.19, a fall of 0.44 inch, SW., heavy rain; Santiago, 29.28, a fall of 0.39 inch, NE., force 7, heavy rain; in 35°, 40' N., 14°, 25' W., WNW., force 6, cloudy; Funchal, 29.48, W., clearing; Madrid, 29.45, S., cloudy; San Fernando, 29.54, a fall of 0.20 inch, SSW., rain. 28th, depression central with increased pressure, in northern Spain, lowest barometer at Santiago, 29.30. During the day passed eastward over the Mediterranean, being central on the 29th near Malta inclosed by the isobar of 29.60. The barometer along the southern coast of France fell from 0.10 to 0.15 inch with winds shifting to N. and NE., with rain. 30th, depression central, with diminished pressure, over Italy, inclosed by the isobar of 29.40, lowest barometer, at Pesaro, 29.29, a fall of 0.43 inch in the past 24 hours; rain generally prevailed throughout the kingdom. The further course of this area will appear on the December chart. Of the storms over Europe the following descriptions are given: No. II.—Following the the passage over northern Scandinavia of area No. XVII of the October chart, the pressure on the 1st fell quite suddenly over southern Scandinavia, lowest barometer at Christiania, 29.38; rain quite general over Norway and Sweden, with northeast to southeast winds. 2d, depression central over the Baltic, pressure at the centre gradually increasing; the area of precipitation greatly enlarged, embracing eastern Scandinavia, Germany, Austria and western Russia; snow was reported from Brono, Dorpat and St. Petersburg. 3d, central south of the Gulf of Finland, lowest barometer at St. Petersburg, 29.35, a fall of 0.36 inch in past 24 hours, NNE., snow; Dorpat, 29.39, a fall of 0.29 inch., WSW., cloudy; over the Baltic and to the southward the winds shifted to northwesterly, with rising barometer and cloudy or partly weather, with occasional rain. 4th, central area greatly enlarged, a trough of low-pressure running from the Black Sea northeastward to the Arctic ocean; lowest barometers at Archangel, 29.34, and Moscow, 29.39. 5th, central near 60° N., 50° E.; Kasan, 29.40, a fall of 0.25 inch, SW., snow; Ekaterinburg, 29.72, a fall of 0.35 inch, SSE., cloudy; Krotkovo, 29.50, a fall of 0.30 inch, W., cloudy. 6th, Ekaterinburg, 29.34, SSE., snow; Kasan, 29.74, W., cloudy; Krotkovo, 29.86, NW., cloudy. 7th and 8th, disappeared in an area of high-pressure (30.40) over central Siberia. No. V.—While area No. II covered central Russia on the 4th the present area appeared off the northwestern coast of Norway. On the 5th, the central depression occupied northern Scandinavia; Tromso, 29.22, a fall of 0.60 inch in past 24 hours, SW., rain; Brono, 29.38, a fall of 0.56 inch, SW., rain. On this day the isobar of 29.80 covered Scandinavia and more than two-thirds of Russia, running southeastward into Toorkistan. 6th, central over the Gulf of Finland, with the area of precipitation extending southwestward to France and south to Turkey; St. Petersburg, 29.48, SE., light snow; Dorpat, 29.34, ESE., light snow; Wilna, 29.48, SW., fair. 7th, central east of the White sea, with greatly diminished energy; Archangel, 29.78, a rise of 0.13 inch, wind WSW. The rapid advance of a high-pressure area (30.40) over Toorkistan and southwestern Siberia caused the disappearance of this depression on the 8th. No. IX.—This area succeeded No. V very rapidly, appearing over northern Norway, while the latter was yet central near the White sea. 7th, Tromso, 29.41, a fall of 0.19 inch in past 24 hours, NE., rain; Haparanda, 29.71, E., snow; Brono, 29.49, a fall of 0.11 inch, WNW., rain. 8th, central southwest of the White sea; Archangel, 29.15, a fall of 0.63 inch in past 24 hours, ESE., cloudy; St. Petersburg, 29.30, a fall of 0.56 inch, NW., light rain. 9th, central near 60° N., 50° E.; Kasan, 29.41, a fall of 0.75 inch in past 24 hours, S., cloudy; Krotkovo, 29.50, a fall of 0.80 inch, SW., cloudy. 10th, central over the Ural Mountains in the vicinity of 55° N.; Ekaterinburg, 29.39, a fall of 0.48 inch, calm, cloudy. 11th, central in the Province of Yeniseisk, but with greatly diminished energy, finally disappearing on the following day over northern Siberia. Yeniseisk reported a fall of 0.11 inch on the 11th, wind shifting from E. to ESE., with heavy snow. No. XI.—While area No. I was central on the 11th over the White sea and before a complete recovery of pressure over Scandinavia the barometer fell with considerable suddenness over the Islands north of Scotland; Thorshavn, 29.42, a fall of 0.39 inch, NE., force 6 cloudy; North Unst, 29.50, a fall of 0.33 inch, S., cloudy; Sandwick Manse, 29.34, a fall of 0.69 inch, SW., cloudy. During the day depression



passed southeastward into Denmark, where it was central on the 12th; Copenhagen, 29.30, a fall of 0.56 inch, E., rain; Fanoe, 29.27, a fall of 0.57 inch, calm, rain; the isobar of 29.60 covered nearly the whole of central Europe; rain prevailed very generally over the German Empire and eastern France. 13th, central over eastern Russia; Königsburg, 29.38, a fall of 0.14 inch, SW., heavy snow; Memel, 29.35, a fall of 0.15 inch, N., cloudy; rain or snow, with brisk to high northwest winds and gales, prevailed throughout Prussia and Bavaria and a thunder-storm was reported from Munich. 14th, central in southwestern Russia with increased pressure; Wilna, 29.52, calm; Kieff, 29.51, NW.; over the Baltic and throughout Prussia and Bavaria north to west winds increasing to gales, with rain, sleet or snow, prevailed; at Berlin a hurricane was reported on the 13th and 14th. 15th, depression about stationary with conditions unchanged to the westward. 16th, depression moved northward to near the Baltic coast, centre rapidly filling up; the violent storms of wind, rain, sleet and snow still continued to the south and west, but by morning of the 17th clearing weather, with winds shifting to east and south and rapidly rising pressure, prevailed. Depression on this day situated north of the Black sea; Nikolaiev, 29.72, S., rain; Kieff, 29.79, NE., cloudy, huge piles of drifting snow. During the day the depression disappeared in a high pressure area (30.60) prevailing in the vicinity of the Caspian sea. The peculiar movement of this area from the 13th to the 16th inclusive was probably due to the persistency of an area of high pressure over central and eastern Russia, which condition was not relieved until the 16th, when an area of 30.40 appeared over France moving northeastward, while at the same time No. IV covered the ocean between Iceland and Norway. No. XXI.—This area may have been a continuation of No. IV which was lost sight of off the northern coast of Norway during the 18th, owing to the rapid advance northward of an area 30.60 over northern Europe. Perhaps the depression remained intact north of the 70th parallel, beyond which latitude we have no data, and put in an appearance on the 20th, in northwestern Siberia. 20th, Barnaul, 29.81, a fall of 0.79 inch in past 24 hours, SW., snow; Yeniseisk, 29.70, a fall of 0.52 inch, SW., snow. 21st, depression moving southeastward; Yeniseisk, 29.43, SW., snow; Barnaul, 29.52, SW., snow. 22d, Yeniseisk, 29.74, W., snow; Barnaul, 29.45, NW., snow. 23d Yeniseisk, 30.24, SSW., fair; Barnaul, 30.47, W., clear. During the 22d depression disappeared over the Province of Irkoutsk in an area of high pressure (30.40) then prevailing in that region. No. XXVII.—Following the passage of area No. XVII over Scandinavia on the 22d the barometer again fell over the northern portion of this country developing a depression on the 25th which by the following morning embraced northern Europe between the parallels of 60° and 70° N., and the meridians of 40° and 16° E.; lowest pressure at Haparanda, 29.78, NE.; Archangel, 29.82, ENE.; St. Petersburg, 29.83, SW., snow. On the morning of the 26th a small area of 29.80, with snow, appeared just north of the Black sea, which during the day merged with area No. XXVII forming a barometric trough extending southwestward from the White sea and including the whole of central Russia. By morning of the 27th, this extended depression contracted to small area of 29.40 situated in about 50° N., 30° E.; Kieff, 29.37, a fall of 0.43 inch, NNE., snow and fog; Nikolaiev, 29.39, a fall of 0.44 inch, NW., rain. During the day the depression curved to the northeast and with greatly diminished pressure was central, morning of the 28th, in central Russia; Kasan, 28.97, a fall of 0.94 inch, SE., snow; Moscow, 29.13, a fall of 0.63 inch, SE., cloudy; Archangel, 29.76, a fall of 0.17 inch, ENE., cloudy; St. Petersburg, 29.47, a fall of 0.09 inch, NW., light snow. 29th, central in northeastern Russia; Archangel, 29.51, NNE., cloudy; Kasan, 29.48, WSW., cloudy; Ekaterinburg, 29.24, a fall of 0.80 inch, SW., light snow; Moscow, 29.56, S., light snow. During the day depression passed eastward to the valley of the Obi where it was central on the morning of the 30th, disappearing thereafter over northern Siberia in an area of high pressure, 30.20. No. XXVIII.—This area developed during the 24th and 25th over the Mediterranean south of France, pressure generally below 29.85 with cloudy weather, easterly winds and rain along the southern coast of France and the western coast of Italy. 26th, the isobar of 29.80 embraced the whole of southern Europe between the parallels of 38° and 46° N., and thence westward over the Atlantic to 35° W. This extended depression embraced two smaller areas, one 29.40 (area No. XXIV) and the other 29.70 (area No. XXVIII) the latter occupying the Mediterranean in the vicinity of Sardinia. During the 27th and 28th the depression moved southeastward off the western coast of Italy and was finally lost sight of through the influence of advancing area No. XXIV central on the 28th off the eastern coast of Spain. Of the storms off the Asiatic coast the following descriptions are given: No. III.—During the 1st the barometer along the southeastern coast of the Island of Nippon fell from 0.10 to 0.20 inch developing on the 2nd a depression which moved northeastward with comparatively slight energy; no violence was effected at land stations; 2d, in 38°, 47' N., 148°, 27' E., 29.92, NW., rough sea, cloudy; 3d, in 40°, 27' N., 152°, 19' E., variable winds, rough sea, rain. 4th, in 42°, 01' N., 156°, 36' E., 29.70, NW., rough weather, cross seas, rain. 5th, in 43°, 15' N., 161° 48' E., 29.75, rough weather, cross seas, NW., hail; in 31°, 12' N., 174°, 08' W., 30.12, SW., moderate sea, cloudy. 6th, in 44°, 20' N., 167°, 19' E., moderate sea, NW., cloudy; in 31°, 12' N., 179°, 88' W., 30.06, SW., moderate sea, show, ery. 7th, in 45°, 04' N., 172°, 09' E., 29.85, N., moderate sea, hail; in 31°, 05' N., 175°, 23' W., 29.81, heavy SW. squalls, tremendous sea. On the 8th the depression disappeared in an area of high pressure (30.30) with clearing weather and easterly winds. No. VII.—This area formed



over the China sea during the 5th and 6th; on the latter date barometer at Hong Kong read 29.99, a fall of 0.13 inch in past 24 hours, wind shifted from NE. to N., with rain; Manilla, Philippine Islands, 29.83, a rise of 0.08 inch, wind shifted from SSW. to SE., followed by rain. 7th, Manilla, 29.76, SE., cloudy; to the northward along the Japan Islands the winds were northeasterly with falling barometer and cloudy or threatening weather. 8th, Manilla, 29.75, NNW., cloudy, 1.15 inches rain-fall in past 24 hours; Zi-Ka-Wei, 30.32, rain, wind NNW.; pressure rapidly falling along the southern coast of the Japan Islands. 9th, Manilla, 29.67, SW., rain; Nagasaki, 29.87, a fall of 0.27 inch in past 24 hours; Wakayama, 29.72, a fall of 0.41 inch, ENE., rain; Tokei, 29.78, a fall of 0.20 inch, NNE., rain; in 37° 10' N., 148° 24' E., 29.76, NNW., fair. 10th, Nagasaki, 29.96, N., clear; Manilla, 29.78, E., clear; Wakayama, 29.70, N., fair; Tokei, 29.54, NNE., rain; in 37° 28' N., 148° 35' E., 29.98, NNE., heavy sea, rain. 11th, depression passed to the eastward, followed over the Japan Islands by clearing weather, rapidly rising pressure and winds shifting to east and northeast; in 38° N., 148° 50' E., 29.89, NNW., heavy sea, fair; in 30° 59' N., 158° 02' E., 29.75, W., heavy squalls. On the 12th disappeared to the eastward in an area of high pressure. No. XV.—This area suddenly appeared in the vicinity of 30° N., 150° E., developing on the 14th a depression inclosed by the isobar of 29.60; in 39° 05' N., 153° 15' E., 29.47, a fall of 0.78 inch in past 24 hours, NW., clear; in 33° 19' N., 144° 23' E., 29.74, N., heavy squalls. During this day and the following the depression moved rapidly northeastward, and by morning of the 16th was lost in an area of high pressure (30.30) in the vicinity of 35° N., 165° E. No. XIX.—This depression developed over the China sea during the 17th and 18th, and moved northeastward south of the Japan Islands, disappearing on the 22d in the vicinity of 35° N., 165° E. Rain with northeasterly winds and the barometer generally above 29.90 prevailed during the 19th and 20th along the Japan coast; the depression was too far south to produce a decided effect along this coast. The following observations show the influence of the storm at Manilla, Philippine Islands: 18th, 29.84, NE., fair; 19th, 29.69 N., cloudy; 20th, 29.57 S., stormy, 4.50 inches rain-fall in past twenty-fours; 21st, 29.81, SE., very cloudy. No. XXVI.—During the 22d and 23d this storm developed over the China Sea south of the 20th parallel; 22d, Macao, 29.81, a fall of 0.13 inch in past 24 hours, wind NE., 8 hours rainfall; Manilla, 29.83, SW., cloudy; in 24° 59' N., 119° 25' E., 29.89, NNE., cloudy. 23d, Macao, 29.84, NE., cloudy; Manilla, 29.84, N. cloudy; in 22° 19' N., 115° 16' E., 29.78, WSW., cloudy. 24th, Hong Kong, 29.95, NW., fair; S. S. *Belgie*, Hong Kong, 29.86, W., cloudy; Manilla, 29.83, SW., 1.39 inches rain-fall in past 24 hours. At Nagasaki and Zi-Ka-Wei the barometer fell from 0.04 to 0.12 inch, wind NE., light rain, but from Wakayama northeastward to Yokohama, there was a slight rise, winds shifted from SW. to E. and NE. 25th, at Manilla and Hong Kong winds shifted to N. and NW., with slowly rising pressure and clear or partly cloudy weather; over Japan rain was general with easterly winds and pressure about 30.00 except at Nagasaki where the barometer read 29.92. During the day depression shifted its course more to the east leaving the Japan Islands a greater distance to the north which caused a cessation of atmospheric disturbance in that region followed on the morning of the 26th by clear and clearing weather; slightly higher pressure prevailed from Nakasaki westward, and slightly lower northeastward to Yokohama. 27th, depression disappeared over the ocean in the vicinity of 30° N., 155° E. Along the Japan coast the barometer rose from 0.10 to 0.25 inch; winds shifting to N. and NW. with clear or partly cloudy weather.

## TEMPERATURE OF THE AIR.

The mean temperature of the air for October, 1881, is shown by the isothermal lines (in red) on chart No. II. The table of mean and comparative temperatures in the right hand corner of the chart shows, in the first column, the average for the month throughout the various districts, as deduced principally from observations taken at Signal Service stations. In the two remaining columns are shown the means for the present month, and the departures of such means from the average for many years. The temperature is everywhere above the normal east of a line running from the Rio Grande valley northeastward to Lake Superior. Within this extensive region of country the departures of excess range from 1°.3 in New England to 6°.5 in the Eastern Gulf states. Mount Washington shows a deficiency of 1°.1. Over the remainder of the country to the west the temperature is everywhere below the normal with but one exception, the Middle Rocky Mountain slope, where an excess of 5°.1 appears. The departures of deficiency range from 0°.8 in Minnesota to 6°.8 in the Northern Rocky Mountain slope. As a means of interesting comparison, the following maximum departures from the normal are given for each year since 1872, together with the corresponding districts: 1873, —5°.0 Upper Mississippi valley, and —4°.5 Minnesota; 1874, +3°.0 Minnesota, and +2°.9 Upper Mississippi valley; 1875, —4°.6 St. Lawrence valley, and —3°.7 South Atlantic states; 1876, —4°.0 Minnesota, and —4°.2 South Atlantic States; 1877, +4°.6 Lower Lake region; 1878, +4°.8 New England; 1879, +9°.4 Upper Mississippi valley and Minnesota; 1880, —4°.0 Rio Grande valley, and —3°.7 Southeast Rocky Mountain slope.

*Ranges of Temperature at Signal Service Stations.*—Monthly ranges in general varied from 35° to 50° over the country east of the Rocky Mountains and from 45° to 60° westward to the Pacific.